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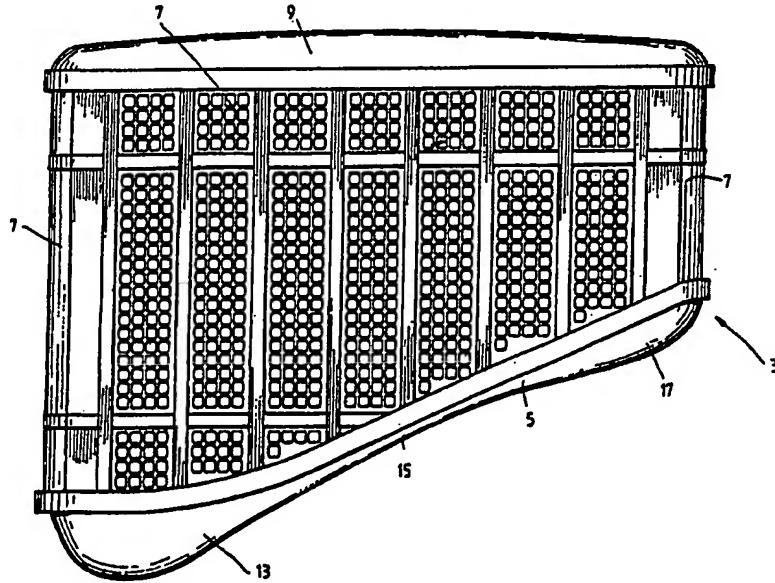
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(71) Applicant (for all designated States except US): BRIVIS AUSTRALIA PTY. LTD. [AU/AU]; 61 Malcolm Road, Braeside, VIC 3195 (AU).			
(72) Inventor; and (75) Inventor/Applicant (for US only): O'BRIEN, Timothy, Frank [AU/AU]; 61 Malcolm Road, Braeside, VIC 3195 (AU).			
(74) Agent: GRIFFITH HACK; 509 St. Kilda Road, Melbourne, VIC 3004 (AU).			

(54) Title: EVAPORATIVE AIR CONDITIONER



(57) Abstract

A roof-mounted evaporative air conditioner is disclosed. The air conditioner includes a housing (3) defined by a base (5) which conforms to the pitch of the roof (11) and includes an outlet (23) for air to flow from the housing into ductwork (25); a plurality of vertical side walls having water absorbent panels (7) that defines an inlet for air to flow into the housing (3); and a top wall (9). The air conditioner further includes a water distribution system for supplying water to the panel(s) and a fan assembly for drawing air into the housing via the panel(s) so that the air is cooled by evaporating water in the panel(s).

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EVAPORATIVE AIR CONDITIONER

5 The present invention relates to an evaporative air conditioner.

10 The present invention relates particularly to an evaporative air conditioner that conforms to the roof-line of a house.

Conventional domestic air conditioners comprise:

15 (i) a housing defined by side walls, a base, and a top wall, with one or more of the side walls comprising water absorbent porous panels;

20 (ii) a water distribution system to supply water to the panels;

25 (iii) a fan for drawing air into the housing via the panels such that the air is cooled via heat exchange with water in the panels; and

(iv) an outlet for discharging cooled air from the housing into ductwork for distributing the cooled air.

30 Conventional domestic air conditioners are usually roof-mounted, with the housing being supported well above the roof-line by means of a hollow dropper

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tube which also defines part of the ductwork for supplying cooled air to a house. The positioning of the housing well above the roof-line makes the conventional domestic air conditioners a prominent feature of houses 5 that, in many instances, detracts from the overall appearance of houses and is an adverse factor on marketing of conventional air conditioners.

An object of the present invention is to provide 10 a roof-mounted evaporative air conditioner which is not as prominent as conventional domestic roof-mounted air conditioners.

According to the present invention there is 15 provided a roof-mounted evaporative air conditioner which includes:

(a) a housing defined by:

20 (i) a base which conforms to the pitch of the roof and includes an outlet for air to flow from the housing into ductwork;

25 (ii) a plurality of vertical side walls, with at least one side wall including a water absorbent panel that defines an inlet for air to flow into the housing; and

30 (iii) a top wall;

(b) a water distribution system for supplying

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water to the panel(s); and

5 (c) a fan assembly for drawing air into the housing via the panel(s) so that the air is cooled by evaporating water in the panel(s).

The present invention is based on the realisation that forming an evaporative air conditioner 10 having a housing with a base that conforms generally to the pitch of a roof and side walls that extend vertically when the air conditioner is mounted to the roof makes the air conditioner compatible with and not a prominent feature of the roof. In particular, the 15 present invention makes it possible to minimise the spacing of the top wall of the housing above the roof.

It is preferred that the base be located on or a 20 short distance only above the roof-line of the roof.

It is preferred that the top wall of the housing be generally horizontal.

It is preferred that the base include a 25 generally wave-like configuration when viewed in side elevation, with a convex lower section, a concave middle section, and a convex upper section. The applicant has found that the wave-like configuration enables the base to match closely a range of different roof pitches.

30 It is preferred that the air conditioner includes a collar which is connected to the roof and defines a support for the housing and other components

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of the air conditioner and a transition between the outlet of the housing and the ductwork.

5 It is preferred particularly that the collar be mounted to the roof frame.

It is preferred particularly that the collar be at least substantially located below the roof-line.

10 It is preferred that the air conditioner includes a suspension system for suspending the housing and other components of the air conditioner in position above the roof-line.

15 It is preferred particularly that the suspension system be mounted to the collar.

It is preferred that the suspension system includes:

20 (i) a support arm extending upwardly from the collar to each upper corner section of the housing; and

25 (ii) a suspension member extending downwardly from the upper section of each corner and connected to the base.

It is preferred that the air conditioner further 30 includes a brace element extending between the collar and the lower end of each suspension arm.

The applicant has found that positioning

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support members, suspension arms, and brace members to form a plurality of triangular assemblies results in a particularly effective support structure.

5 It is preferred that the water distribution system includes a water trough formed in a lower section of the base.

10 It is preferred that the water distribution system includes a water distribution tray positioned in an upper section of the housing and arranged to distribute water to the panel(s).

15 It is preferred that the water distribution system further include a means for pumping water from the water trough to the water distribution tray.

20 It is preferred that the water distribution system be adapted to supply different flow rates of water to each panel. This is an important feature in a situation where the air conditioner comprises panels in the upper and lower side walls of the housing so as to enable the water supply to the panels to be adjusted to take into account the different sizes of the panels.

25

According to the present invention there is also provided an evaporative air conditioner for mounting to a roof of a house, which air conditioner is characterised by a housing having a base which is adapted to conform to the pitch of the roof and a plurality of side walls adapted to extend vertically when the air conditioner is positioned on the roof, with at least one side wall including a water absorbent

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porous panel that defines an inlet for air to flow into the housing.

It is preferred that the housing further
5 includes a top wall that is adapted to extend horizontally when the air conditioner is positioned on the roof.

It is preferred that the base includes a
10 generally wave-like configuration when viewed in side elevation, with a convex lower section, a concave middle section, and a convex upper section.

It is preferred that the air conditioner further
15 includes a water distribution system.

It is preferred particularly that the water distribution system includes:

20 (i) a water trough formed in a lower section of the base;

(ii) a water distribution tray positioned in a upper section of the housing for supplying water onto an upper edge of the panel(s); and

(iii) a means for pumping water from the water trough to the water distribution tray.

30

It is preferred that the base include an outlet for air to flow from the housing into ductwork.

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It is preferred that the air conditioner further includes a collar for supporting the housing and other components of the air conditioner which is adapted to be connected to the roof frame of the house and to define a 5 transition between the outlet in the base and the ductwork.

It is preferred that the air conditioner further includes a fan for drawing into the housing via the side 10 wall panel(s) and for discharging air from the housing via the outlet.

It is preferred that the fan be mounted to the collar.

15 The present invention is described further by way of example with reference to the accompanying drawings of which:

20 Figure 1 is a side elevation of a preferred embodiment of an evaporative air conditioner in accordance with the present invention;

25 Figure 2 is a vertical section through the air conditioner;

Figure 3 is a section along the line 3-3 in Figure 2; and

30 Figure 4 is a section along the line 4-4 in Figure 2.

The preferred embodiment of the evaporative air

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conditioner shown in the figures is mounted on a roof 11 of a house and is operable to supply cooled air via ductwork 25 to the rooms of the house.

5 With reference to the Figures, the evaporative air conditioner includes a housing, generally identified by the numeral 3, having a base 5, 4 side walls including water absorbent porous panels 7, and a top wall 9.

10 With particular reference to Figure 2, the housing is constructed so that, in use, when the evaporative air conditioner is mounted on the roof 11, the base 5 conforms closely to the pitch of the roof 11, 15 the side wall panels 7 extend vertically, and the top wall 5 extends horizontally. This construction of the housing 3 makes the evaporative air conditioner compatible with and not a prominent feature of the roof 11. In particular, unlike many conventional air 20 conditioners that are mounted on dropper tubes that locate the air conditioners well above the roof-line, the air conditioner shown in the figures is located close to the roof-line.

25 With reference to Figure 1, in order to accommodate a range of pitch variations, while maintaining compatibility of the air conditioner with the roof 11, the base 5 includes a wave-like configuration in side elevation, with a convex lower 30 section 13, a concave middle section 15, and a convex upper section 17.

Whilst not an essential feature of the present

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invention, an important feature is that the structural components of the preferred embodiment of the air conditioner are located in or underneath the housing 3 so that the principal purpose of the visible exterior 5 construction of the roof-mounted housing is to optimise the compatibility of the air conditioner and the roof 11.

With reference to Figure 2, the air conditioner 10 includes a collar 19 located underneath the base 5 that is connected by bolts (not shown) or other suitable means to the roof 11, and more particularly to the roof frame 21, and defines a support for the housing 3 and the other components of the air conditioner.

15

The base 5 of the housing 3 is formed with an opening 23 which defines an outlet for cooled air from the housing 3. The collar 19 is aligned with and forms an extension of the outlet opening 23 and provides a 20 mounting surface for the ductwork 25 so that, in use, cooled air from the housing 3 flows via the outlet opening 23 and the collar 19 into the ductwork 25 and, thereafter, is distributed to the rooms of the house.

25

The air conditioner further includes a water distribution system for distributing water to the side wall panels 7.

The water distribution system includes a water 30 distribution tray 35 mounted in an upper section of the housing 3. With particular reference to Figure 3, the tray 35 has a central opening 47 which defines an inlet for supplying water to the tray 35. Furthermore, the

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tray 35 has a slightly downwardly sloping surface over which, in use, water flows towards the periphery of the tray 35. The tray 35 further includes an upwardly extending wall 39 at the periphery of the tray 35 and a 5 series of water outlets 37 inboard of the wall 39. The outlet openings 37 are positioned so that, in use, water from the inlet opening 47 flows through the outlet openings 37 onto the upper surface of the side wall panels 7.

10

The water distribution system further includes a water trough 41 in the lower section of the base 5, and a means (not shown) for pumping water from the water trough 41 to the inlet in the tray 35. In use, the 15 water trough 41 receives water from a main supply (not shown) and as runoff from the side wall panels 7.

The water distribution system is adapted to supply different flow rates of water to the side wall 20 panels 7 to take into account the different sizes of the panels 7.

The evaporative air conditioner further includes a suspension system for supporting the housing 3 and 25 other components of the air conditioner from the roof 11.

The suspension system includes:

30 (i) 4 support members 29 that are connected to the collar 19 and extend upwardly from the collar 19 to the upper corners of the housing 3; and

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5 (ii) 4 suspension arms 31 which are arranged so that one suspension arm 31 extends downwardly from each support member 29 and is connected at a lower end to the base 5.

10 In effect, the housing 3 and other components of the air conditioner are suspended via the above- described suspension system.

15 In order to further strengthen the support for the housing 3, the air conditioner further includes 4 brace members 33 that extend generally horizontally outwardly from the collar 19 and are connected to the lower ends of the suspension arms 31.

20 Each assembly of the support members 29, the suspension arms 31 and the brace members 33 define a triangular structure that is a particularly effective support for the air conditioner.

25 The air conditioner further includes an axial fan (not shown) positioned in the collar 19 and operable to draw air into the housing 3 through the side wall panels 7 and to force cooled air through the outlet opening 23, the collar 19, and the ductwork 25.

30 The air conditioner further includes water management and electronic control systems 51 for controlling the operation of the air conditioner located in a chamber 53 moulded in the base 5.

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The above-described preferred embodiment of the air conditioner of the present invention operates efficiently and effectively.

5 Many modifications may be made to the preferred embodiment of the present invention without departing from the spirit and scope of the invention.

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CLAIMS:

1. A roof-mounted evaporative air conditioner which includes:

5

(a) a housing defined by:

10

(i) a base which conforms to the pitch of the roof and includes an outlet for air to flow from the housing into ductwork;

15

(ii) a plurality of vertical side walls, with at least one side wall including a water absorbent panel that defines an inlet for air to flow into the housing; and

20

(iii) a top wall;

25

(b) a water distribution system for supplying water to the panel(s); and

30

(c) a fan assembly for drawing air into the housing via the panel(s) so that the air is cooled by evaporating water in the panel(s).

2. The air conditioner in claim 1 wherein the base is located on or a short distance only above the roof-line of the roof.

3. The air conditioner defined in claim 1 or

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claim 2 wherein the top wall of the housing is generally horizontal.

4. The air conditioner defined in any one of
5 the preceding claims wherein the base includes a
generally wave-like configuration when viewed in side
elevation.

5. The air conditioner defined in claim 4
10 wherein the base includes a convex lower section, a
concave middle section and a convex upper section when
viewed in side elevation.

6. The air-conditioner defined in any one of
15 the preceding claims includes a collar which is
connected to the roof and defines a support for the
housing and other components of the air conditioner and
a transition between the outlet of the housing and the
ductwork.

20
7. The air conditioner defined in any one of
the preceding claims further includes a suspension
system for suspending the housing and other components
of the air conditioner in position above the roof-line.

25
8. The air conditioner defined in claim 7
wherein the suspension system is mounted to the collar.

9. The air conditioner defined in claim 8
30 wherein the suspension system includes:

(i) a support arm extending upwardly from the
collar to each upper corner section of

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the housing; and

5 (ii) a suspension member extending downwardly from the upper section of each corner and connected to the base.

10. The air conditioner defined in claim 9 further includes a brace element extending between the collar and the lower end of each suspension arm whereby 10 the support members, the suspension arms, and the brace members to form a plurality of triangular support structures.

11. An evaporative air conditioner for 15 mounting to a roof of a house, which air conditioner is characterised by a housing having a base which is adapted to conform to the pitch of the roof and a plurality of side walls adapted to extend vertically when the air conditioner is positioned on the roof, with 20 at least one side wall including a water absorbent porous panel that defines an inlet for air to flow into the housing.

12. The air conditioner defined in claim 11 25 wherein the housing further includes a top wall that is adapted to extend horizontally when the air conditioner is positioned on the roof.

13. The air conditioner defined in claim 11 30 or claim 11 wherein the base includes a generally wave-like configuration when viewed in side elevation.

14. The air conditioner defined in claim 13

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wherein the base includes a convex lower section, a concave middle section, and a convex upper section.

15. The air conditioner defined in any one of
5 claims 11 to 14 further includes a water distribution
system.

16. The air conditioner defined in claim 15
wherein the water distribution system includes:

10

(i) a water trough formed in a lower section
of the base;

15

(ii) a water distribution tray positioned in a
upper section of the housing for
supplying water onto an upper edge of the
panel(s); and

20

(iii) a means for pumping water from the water
trough to the water distribution tray.

25

17. The air conditioner defined in any one of
claims 11 to 16 wherein the base includes an outlet for
air to flow from the housing into ductwork.

30

18. The air conditioner defined in any one of
claims 10 to 16 further includes a collar for supporting
the housing and other components of the air conditioner
which is adapted to be connected to the roof frame of
the house and to define a transition between the outlet
in the base and the ductwork.

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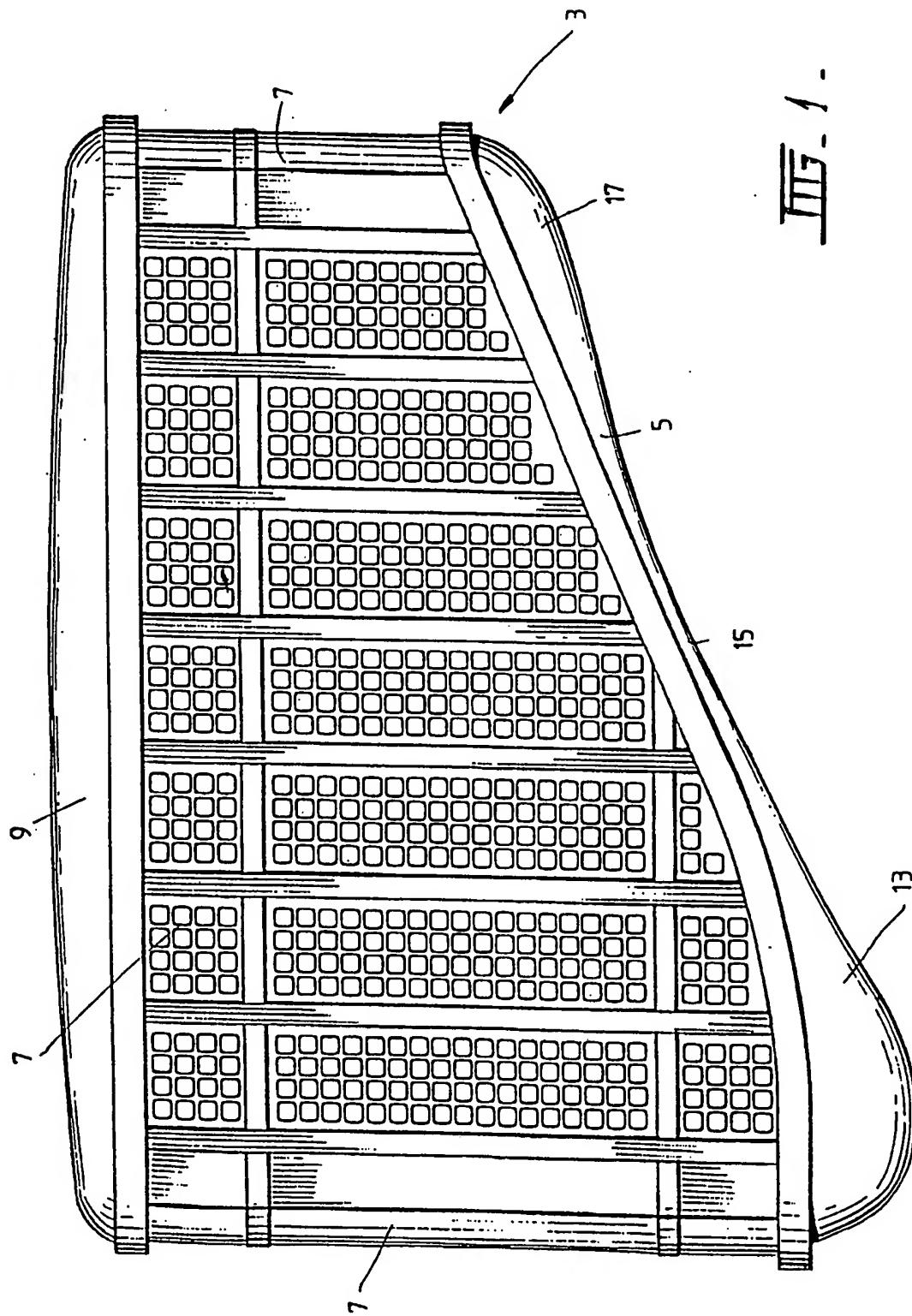
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19. The air conditioner defined in any one of claims 10 to 17 further includes a fan for drawing into the housing via the side wall panel(s) and for 5 discharging air from the housing via the outlet.

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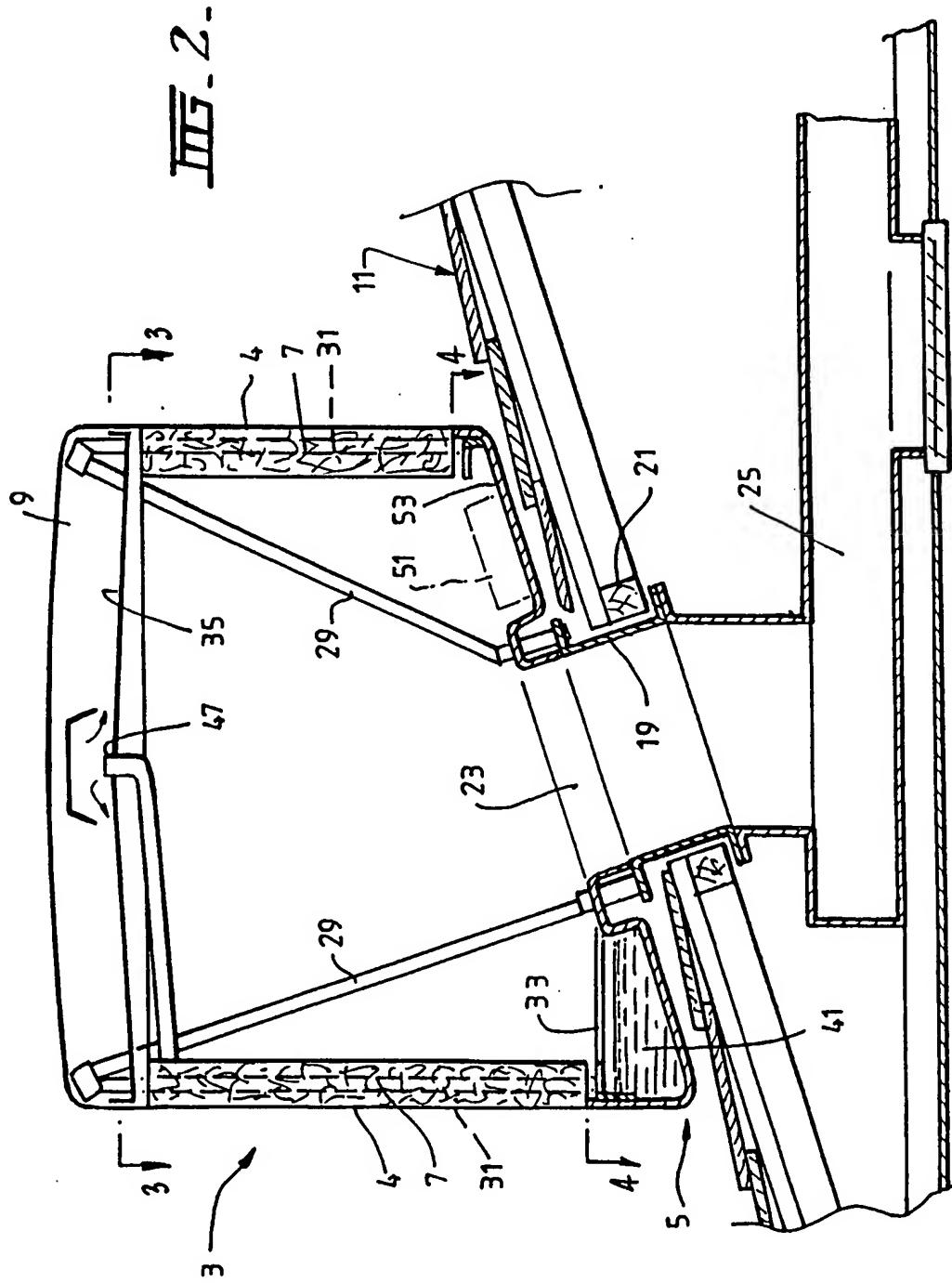
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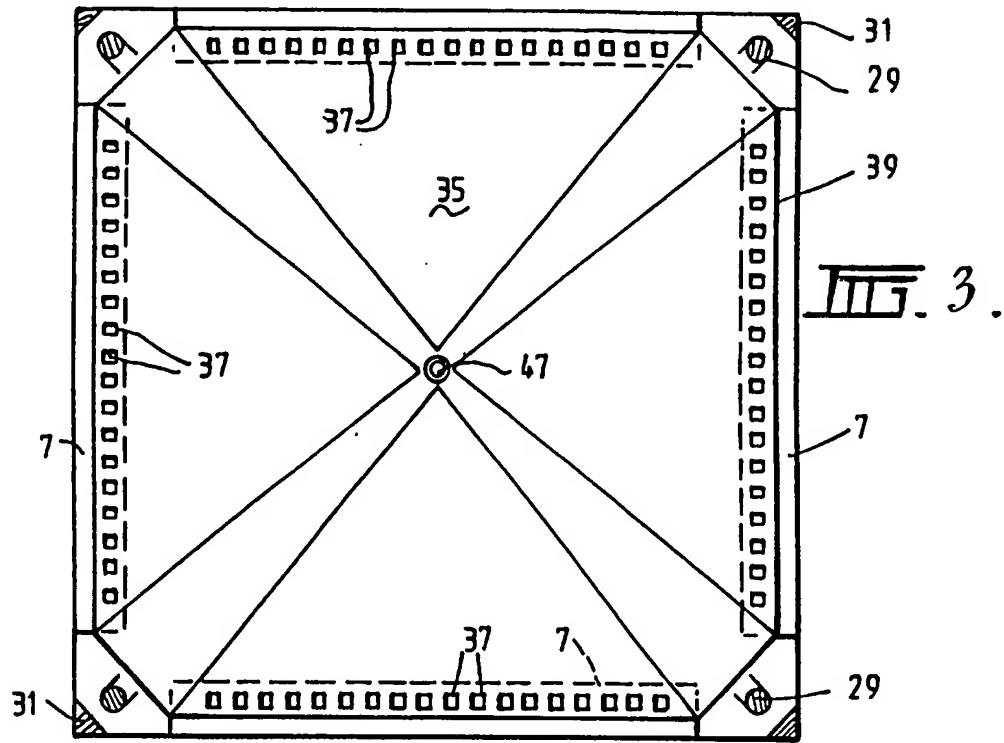
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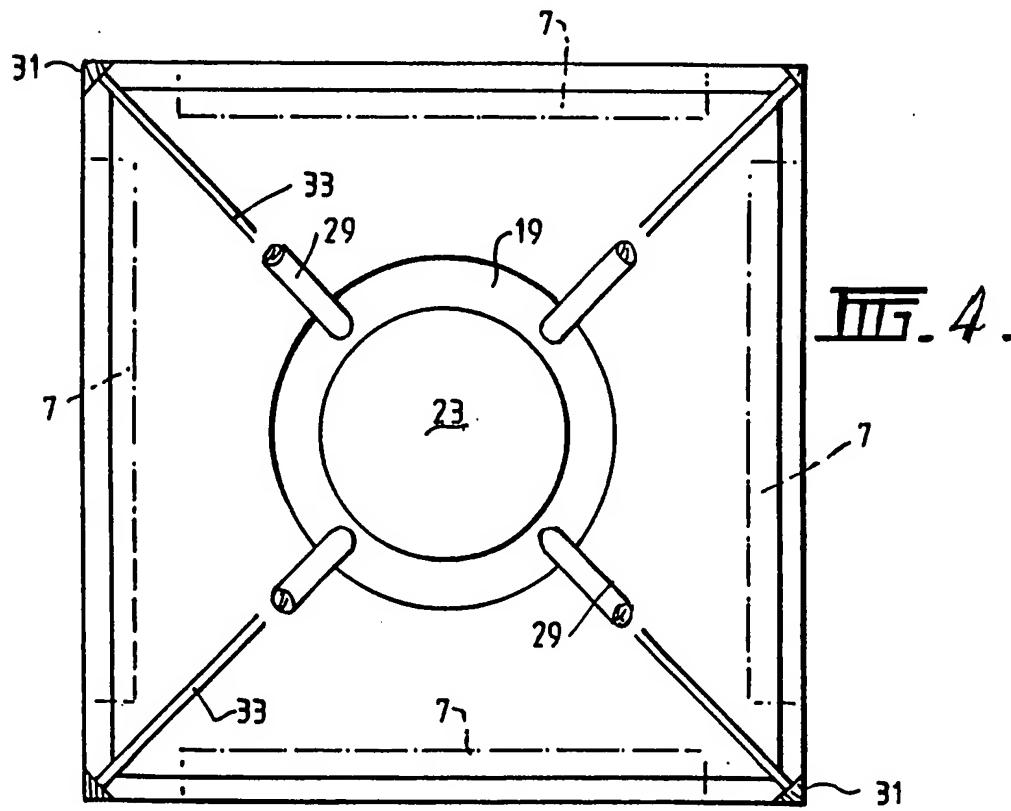
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III. 3.



III. 4.

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INTERNATIONAL SEARCH REPORT

International Application No.
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A. CLASSIFICATION OF SUBJECT MATTER

Int Cl⁶: F24F 13/30, 13/32

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC: F24F 13/30, 13/32

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
AU: IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	AU 17893/95 A (BRIVIS AUSTRALIA) 16 November 1995 See abstract and figure 1	(1, 11, 15-17, 19)
A	AU 14724/95 A (DONLAN) 21 September 1995 See page 5 lines 2-5	
A	AU 65524/90 A (EAST) 23 May 1991. See figure 2 and page 6 line 16 - page 7 line 10	
A	AU 19210/83 (RATCLIFFE) 22 March 1984 See claim 1 and figure 1	
A	US 4895066 A (CARNAHAN) 23 January 1990 See abstract and figure 1	

Further documents are listed in the continuation of Box C

See patent family annex

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Date of the actual completion of the international search 13 MAY 1998	Date of mailing of the international search report 20 MAY 1998
Name and mailing address of the ISA/AU AUSTRALIAN INDUSTRIAL PROPERTY ORGANISATION PO BOX 200 WODEN ACT 2606 AUSTRALIA Facsimile No.: (06) 285 3929	Authorized officer F.C.PEARSON Telephone No.: (06) 283 2195

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International Application No.
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Patent Document Cited in Search Report	Patent Family Member		
AU 65524/90	US	5005373	

END OF ANNEX